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DECUS NO.	8-575
TITLE	EAE OVERLAY FOR FOUR-WORD FLOATING POINT PACKAGE MULTIPLY
AUTHOR	Gregory Ruth
COMPANY	M.I.T. Charles Stark Draper Laboratory Cambridge, Massachusetts
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SOURCE LANGUAGE	PAL-8

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EAE Overlay for Four-Word Floating Point Package Multiply

0. Abstract

This overlay allows the Four-Word Floating Point Package (DEC-08-FMHA-D) to use an EAE in multiplication, thus decreasing the time to interpret an FMPY by a factor of 5.

1. Requirements

Storage--this overlay requires no storage not already occupied by DEC-08-FMHA-D (7; 40-61; 5600-7577). In fact it frees locations 6333-6341 (that is, they are not used with this patch).

Equipment--standard PDP8, 8/I, or 8/E with an EAE.

2. Loading

This overlay should be loaded after DEC-08-FMHA-D has been loaded (i.e. as any other overlay).

3. Restrictions

None. This overlay is compatible with any other Four-Word Floating Point Package overlay that does not alter locations 6333-6577₈. For example, it is compatible with DECUS 8-103 and DECUS 8-188.

4. Accuracy

Accuracy is exactly the same as that of the Four-Word Floating Point Package without the overlay.

5. Execution Time

The average time to interpret an FMPY X on the PDP-8/I (1 step = 1.5 microseconds) is 650 microseconds, as compared with .9 milliseconds for the simple patch suggested in DECUS 8-103 and 3.3 milliseconds without any patch.

6. Listing

/4-WORD FPP EAE PATCH

/LAST MODIFIED ON AUGUST 30, 1972 @10:02

/EAE SYMBOL DEFINITIONS

7621 CAM=7621
7501 MQA=7501
7701 ACL=7701
7421 MQL=7421
7521 SWP=7521
7441 SCA=7441
7403 SCL=7403
7405 MUY=7405
7407 DVI=7407
7411 NMI=7411
7413 SHL=7413
7415 ASR=7415
7417 LSR=7417

0040 *40
00040 0000 EX1, 0
00041 0000 HIGH1, 0
00042 0000 MID1, 0
00043 0000 LOW1, 0
00044 0000 EXP, 0
00045 0000 HORDER, 0
00046 0000 MIDDLE, 0
00047 0000 LORDER, 0
00050 0000 OVER2, 0
00051 0000 OVER1, 0

/MULTIPLICATION PATCH

05675 5675 *5675
 6344 TAB3, FLMY
 6200 FNORM=6200
 6261 ACNEG=6261

6202 *6202 /FIX REFERENCES TO MP1 AND MP2
 06202 3342 DCA MP1
 06203 3343 DCA MP3
 6206 *6206
 06206 2343 ISZ MP3
 6224 *6224
 06224 1343 TAD MP3
 6247 *6247
 06247 2342 ISZ MP1
 6251 *6251
 06251 1342 TAD MP1
 6255 *6255
 06255 1343 TAD MP3
 6342 *6342
 06342 0000 MP1, 0
 06343 0000 MP3, 0
 06344 0000 FLMY, 0
 06345 4361 JMS FMULT
 06346 4200 JMS FNORM
 06347 3050 DCA OVER2
 06350 2754 ISZ I SIGN1
 06351 5744 JMP I FLMY
 06352 4261 JMS ACNEG
 06353 5744 JMP I FLMY
 06354 6750 SIGN1, 6750
 06355 6740 SGNSW, 6740
 06356 6727 SIGNP, 6727
 06357 7700 SMACLA, SMA CLA
 06360 6575 FMRLOC, FMRET

/FLOATING MULTIPLY

/(A*2²⁴+B*2¹²+C)*(D*2²⁴+E*X¹²+F)

06361 0000 FMULT, 0
 06362 1361 TAD FMULT /PUT RETURN ADDRESS ON NEXT PAGE
 06363 3760 DCA I FMRLOC
 06364 7001 IAC
 06365 1040 TAD EX1
 06366 1044 TAD EXP
 06367 3044 DCA EXP /ADD EXPONENTS
 06370 1357 TAD SMACLA /SET UP SIGN ROUTINE
 06371 3755 DCA I SGNSW
 06372 4756 JMS I SIGNP /GO THERE
 06373 1047 TAD LORDER
 06374 3377 DCA F001
 06375 1043 TAD LOW1
 06376 7425 MQL MUY
 06377 0000 F001, 0 /C*F

06400	3373	DCA MUL5	
06401	1043	TAD LOW1	
06402	3205	DCA F002	
06403	1046	TAD MIDDLE	
06404	7425	ML MUY	
06405	0000	F002, 0	/B*F
06406	3374	DCA MPSCON	
06407	7501	ML	
06410	1373	TAD MUL5	
06411	3373	DCA MUL5	
06412	7004	RAL	
06413	1374	TAD MPSCON	
06414	3372	DCA MUL4	
06415	7004	RAL	
06416	3371	DCA MUL3	
06417	1047	TAD LORDER	
06420	3223	DCA F003	
06421	1042	TAD MID1	
06422	7425	ML MUY	
06423	0000	F003, 0	/C*E
06424	3374	DCA MPSCON	
06425	7501	ML	
06426	1373	TAD MUL5	
06427	3373	DCA MUL5	
06430	7004	RAL	
06431	1372	TAD MUL4	
06432	1374	TAD MPSCON	
06433	3372	DCA MUL4	
06434	7530	SZL CLL	
06435	2371	ISZ MUL3	
06436	1043	TAD LOW1	
06437	3242	DCA F004	
06440	1045	TAD HORDER	
06441	7425	ML MUY	
06442	0000	F004, 0	/A*F
06443	3374	DCA MPSCON	
06444	7501	ML	
06445	1372	TAD MUL4	
06446	3372	DCA MUL4	
06447	7004	RAL	
06450	1371	TAD MUL3	
06451	1374	TAD MPSCON	
06452	3371	DCA MUL3	
06453	7004	RAL	
06454	3370	DCA MUL2	
06455	1047	TAD LORDER	
06456	3261	DCA F005	
06457	1041	TAD HIGH1	
06460	7425	ML MUY	
06461	0000	F005, 0	/D*C
06462	3374	DCA MPSCON	
06463	7501	ML	
06464	1372	TAD MUL4	
06465	3372	DCA MUL4	
06466	7004	RAL	

06467	1371		TAD MUL3	
06470	1374		TAD MPSCON	
06471	3371		DCA MUL3	
06472	7530		SZL CLL	
06473	2370		ISZ MUL2	
06474	1042		TAD MID1	
06475	3300		DCA F006	
06476	1046		TAD MIDDLE	
06477	7425		ML MUY	
06500	0000	F006,	0	/B*E
06501	3374		DCA MPSCON	
06502	7501		ML	
06503	1372		TAD MUL4	
06504	3050		DCA OVER2	
06505	7004		RAL	
06506	1371		TAD MUL3	
06507	1374		TAD MPSCON	
06510	3371		DCA MUL3	
06511	7530		SZL CLL	
06512	2370		ISZ MUL2	
06513	1042		TAD MID1	
06514	3317		DCA F007	
06515	1045		TAD HORDER	
06516	7425		ML MUY	
06517	0000	F007,	0	/A*E
06520	3374		DCA MPSCON	
06521	7501		ML	
06522	1371		TAD MUL3	
06523	3371		DCA MUL3	
06524	7004		RAL	
06525	1370		TAD MUL2	
06526	1374		TAD MPSCON	
06527	3370		DCA MUL2	
06530	7004		RAL	
06531	3367		DCA MUL1	
06532	1046		TAD MIDDLE	
06533	3336		DCA F008	
06534	1041		TAD HIGH1	
06535	7425		ML MUY	
06536	0000	F008,	0	/B*D
06537	3374		DCA MPSCON	
06540	7501		ML	
06541	1371		TAD MUL3	
06542	3047		DCA LORDER	
06543	7004		RAL	
06544	1370		TAD MUL2	
06545	1374		TAD MPSCON	
06546	3370		DCA MUL2	
06547	7530		SZL CLL	
06550	2367		ISZ MUL1	
06551	1041		TAD HIGH1	
06552	3355		DCA F009	
06553	1045		TAD HORDER	
06554	7425		ML MUY	
06555	0000	F009,	0	/A*D

06556	3374		DCA MPSCON
06557	7501		MQA
06560	1370		TAD MUL2
06561	3046		DCA MIDDLE
06562	7004		RAL
06563	1367		TAD MUL1
06564	1374		TAD MPSCON
06565	3045		DCA HORDER
06566	5775		JMP I FMRET
06567	0000	MUL1,	0
06570	0000	MUL2,	0
06571	0000	MUL3,	0
06572	0000	MUL4,	0
06573	0000	MUL5,	0
06574	0000	MPSCON,	0
06575	0000	FMRET,	0
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/FOO'S COULD BE USED AS THESE
/REGISTERS TO SAVE EVEN MORE
/SPACE